

Autonomous Underwater Vehicle for Homeland Defense

Larry Langebrake
Department of Marine Science
University of South Florida
140 Seventh Ave. South
St. Petersburg, FL 33701
Phone (727) 553-1008 fax (727) 553-3967 email llange@marine.usf.edu

Peter Betzer
Department of Marine Science
University of South Florida
140 Seventh Ave. South
St. Petersburg, FL 33701
Phone (727) 553-3940 fax (727) 553-3968 email pbetzer@marine.usf.edu

Scot T. Tripp
General Engineer
United States Coast Guard
Research and Development Center
Groton, CT 06340
Phone (860) 441-2680 fax (860) 441-2792 email strip@rdc.uscg.mil

Grant #: N00014-02-1-0719

LONG-TERM GOALS

This is an accompanying project to the Autonomous Ship Detection project (ONR# N00014-02-1-0267). The Autonomous Ship Detection statement of work was modified due to the events of September-11-2001. The U.S. Coast Guard requested and received from the Office of Naval Research the approval to change the focus to the use of Autonomous Underwater Vehicles (AUV) for Port Security Operations. This decision was approved in mid March-2002 and work commenced in the beginning of April- 2002. ONR has specified the use of 12-3/4" diameter vehicles to support the port security efforts. This size restriction was not a consideration in the original proposal, therefore, we will purchase an appropriate AUV based on the vehicle specifications as defined by the results of the Autonomous Ship Detection project.

OBJECTIVES

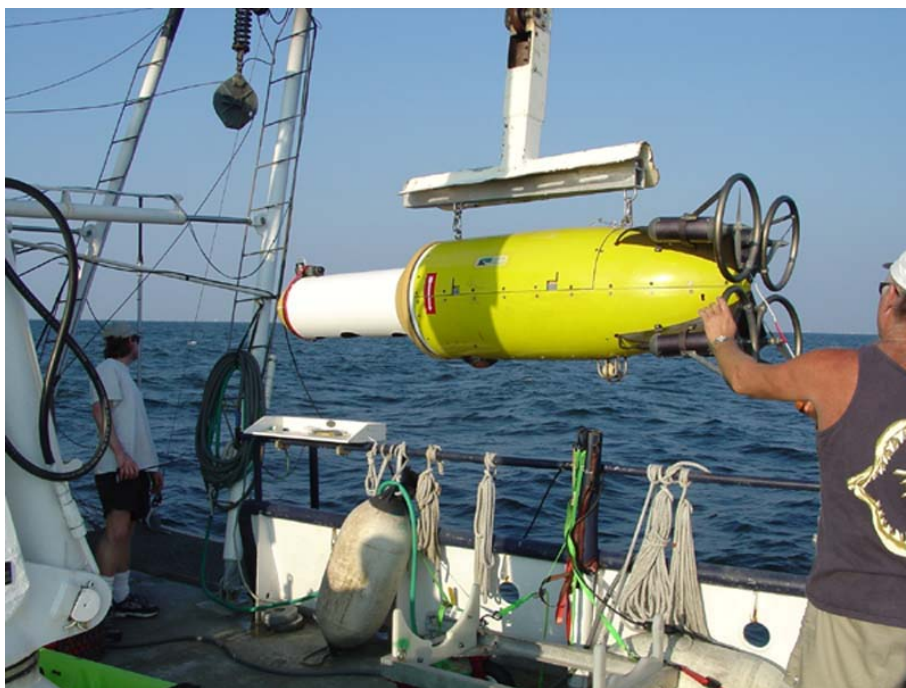
The primary objective is to purchase a 12-3/4" diameter AUV to support the Coast Guard's Port Security requirements for scanning a variety of underwater surfaces (ship hulls, docks & harbor bottoms). This will be addressed by identifying the AUV system requirements needed to support the sensor technologies and operational capabilities required for Homeland Security applications and by developing the appropriate purchasing package.

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 30 SEP 2003		2. REPORT TYPE		3. DATES COVERED 00-00-2003 to 00-00-2003	
4. TITLE AND SUBTITLE Autonomous Underwater Vehicle for Homeland Defense			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Department of Marine Science,,University of South Florida,140 Seventh Ave. South,,St. Petersburg,FL, 33701			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This is an accompanying project to the Autonomous Ship Detection project (ONR# N00014-02-1-0267). The Autonomous Ship Detection statement of work was modified due to the events of September-11-2001. The U.S. Coast Guard requested and received from the Office of Naval Research the approval to change the focus to the use of Autonomous Underwater Vehicles (AUV) for Port Security Operations. This decision was approved in mid March-2002 and work commenced in the beginning of April- 2002. ONR has specified the use of 12-3/4??? diameter vehicles to support the port security efforts. This size restriction was not a consideration in the original proposal, therefore, we will purchase an appropriate AUV based on the vehicle specifications as defined by the results of the Autonomous Ship Detection project.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 4	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

APPROACH

The Coast Guard has selected a Mobile Inspection Package (MIP) approach developed by the Center for Ocean Technology (COT) located at the University of South Florida (USF) (ONR#N00014-03-1-0708) as the primary sensor technology for initial integration and evaluation onboard a 12-3/4" AUV. This system utilizes multiple sensors combined with a high quality geodetic navigation system.

In order to develop and verify the operational requirements (specifications) for a 12-3/4" AUV platform, COT integrated the MIP into a 21" diameter AUV with a 12.75" diameter laser scanning payload (ROBOT ONR# N00014-02-1-0267) that mates with the underwater vehicle ROVEX that was developed by COT. The autonomously guided underwater vehicle ROVEX was selected as the initial testing platform since the vehicle design supports a real time Ethernet and video connection that is extremely useful in developing subsea sensors. The use of this vehicle as an "AUV" test platform will terminate upon receipt of COT's commercially produced AUV scheduled for late spring of 2005 as per this effort.



***Figure 1. ROVEX with ROBOT payload as used during September '03 operations
[The Laser imaging sensor ROBOT as an AUV payload connected to the autonomously guided
underwater vehicle ROVEX.]***

WORK COMPLETED

- Completed specifications for 12.75" AUV
- Attended design review to ensure vehicle requirements would be met
- Arranged for Bluefin to add an inertial navigation system to their design
- Combined ONR grants N00014-02-1-0719 and N00014-02-1-0825 to accommodate vehicle purchase price
- Generated a purchase order for vehicle

- Ordered vehicle in August 2003

RESULTS

USF is scheduled to take delivery of a Bluefin 12 UUV vehicle in May of 2005.

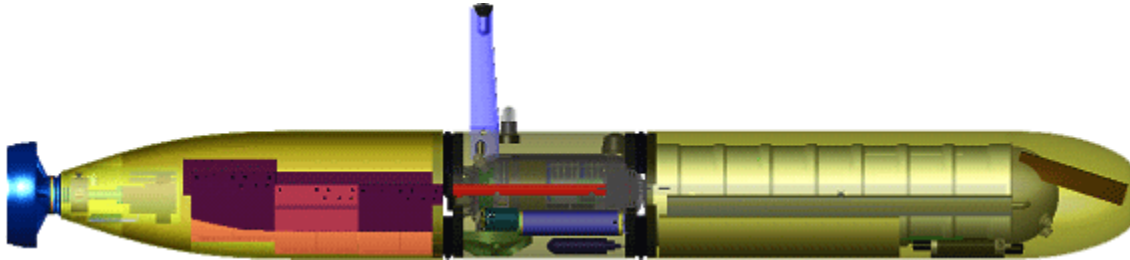


Figure 2. Bluefin 12 UUV

IMPACT/APPLICATIONS

The Coast Guard clearly needs a quick, efficient and cost effective method to scan underwater surfaces to look for potential sabotage as required to protect American seaports. The use of AUVs provides this by acting as a force multiplier (using several AUVs at once), provides a very stable sensor platform, easily supports a wide variety of sensors (laser, sonar, video, chemical, etc.) and minimizes or negates the risk to Coast Guard divers currently required for ship hull inspections.

RELATED PROJECTS

This project is in support of the Testing and Evaluation of the Mobile Inspection Package (ONR# N00014-03-1-0750) in conjunction with the Autonomous Underwater Vehicle for Homeland Defense and Research Support (ONR# N00014-02-1-0825). All of these projects are a result of the modified Autonomous Ship Detection System (ONR# N00014-02-1-0267).